

# Tar Heel Tailings

A newsletter for Gem and Mineral enthusiast in and around the Raleigh, North Carolina area.

## Special Interest Articles:

- Editor Sez
- Cruzeiro Tourmaline Mine

## Editor Sez By George Harris

I hope to have an update on the Website at the meeting.

The program will be Photographing Minerals by Scott LaBorde.

George Harris  
Newsletter Editor,  
Tar Heel Gem and Mineral Club, Inc.



## Expedition to the Cruzeiro Tourmaline Mine in Minas Gerais, Brazil – Part 2

Author: Andrew Lucas, Duncan Pay, Tao Hsu, Shane McClure, and Pedro Padua

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### Regional and Local Geology of the Cruzeiro Mine

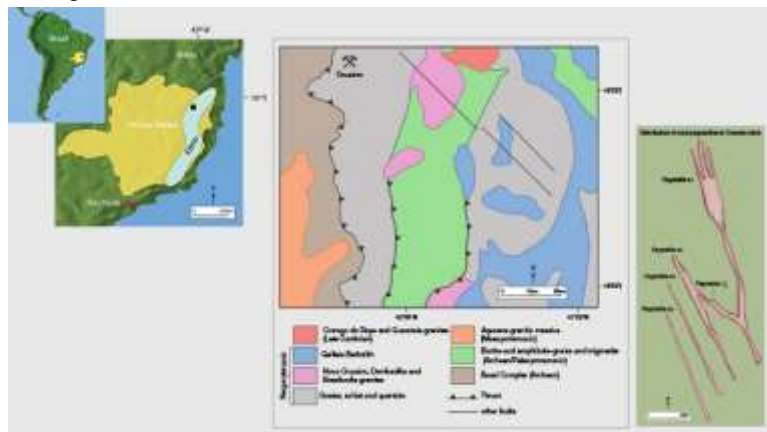
Cruzeiro is one of the world's most important sources for gem and mineral specimens. The main mining area is located in the Safira pegmatite district within the Eastern Brazilian pegmatite province (EBPP). EBPP is one of three important pegmatite provinces, mainly situated in the state of Minas Gerais. The southern part of the state of Bahia and the western margin of the state of Rio de Janeiro are also part of EBPP. There are thousands of gem-bearing pegmatites in Minas Gerais, and

they contain virtually every known pegmatitic gem mineral species.

Neoproterozoic collisions (~1000 to 540 million years ago) led to the final formation of the West Gondwana supercontinent and created the Brazilian orogens of South America and the Pan-African orogens of Africa. Orogens are formations

resulting from large-scale continental collisions. Numerous economically important gem deposits have been discovered and mined along these so-called orogenic belts.

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**Tar Heel Gem & Mineral Club, Inc.**

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**We're on the Web!**

See us at:

[www.tarheelclub.org](http://www.tarheelclub.org)

**Program & Refreshments**

REFRESHMENT SCHEDULE:

Coordinator: Need Volunteer

July TBA

PROGRAM SCHEDULE:

July	Scott LaBorde, Photographing Minerals
August	Ice Cream Social
September	Dan Cathey, Poland Mining Camp, Maine
October	Gary McCutchen, Filing a Claim, How to Get Your Own Mine, grab bags
November	Elections/Movie: Mount St. Helens

Remember, the club will reimburse you for up to \$75 (bring your receipts to the treasurer).

**July B-Day Members**

- Bob Crocker
- Becky Davenport
- John Guerriero
- Bill Layne
- Richard Pyhtila
- John Rustad
- Ann Wease
- Charles Weil
- Mike Welker
- David Willick



Membership applications may be mailed to:

Tar Heel Gem & Mineral Club, Inc.

Attention: Treasurer  
10609 Chelsea Drive  
Raleigh, NC 27603

### Tar Heel Gem and Mineral Club, Inc. - June Meeting Minutes

Tuesday, June 16<sup>th</sup>, 2015

Attendees = ??

**Opening of Club Meeting:**

Cyndy called meeting to order.

**New Business:**

Visitors greeted-Dawn-James-Heather

June birthdays acknowledged

**Refreshments:**

Break for refreshments provided by Eileen

**Program:**

-involved in multiple areas of art including, lapidary, metalsmithing, glass lampwork, woodworking and pottery, quilting, sewing

-slideshow on her cabochons, jewelry, home studio

-video on steps of jewelry making

-demo of techniques



**Old Business:**

Cyndy presented an EFMLS Brochure of classes taught at Wild Acres

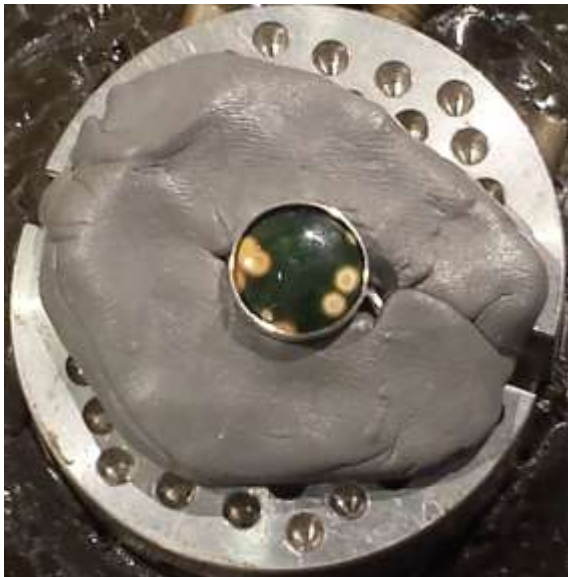
Website update- Cyndy will meet with designer on Thursday evening, everything is pretty well set.

Committee will get together to work on bylaws soon

T-Shirts-Exciting news will be presented at next meeting, 100 Unisex shirts will be ordered, down from the 250 that were ordered last time.



Linda Searcy Presentation



**Door Prize:**

Cyndy called the winning number and Corinne Hummel won and chose a very nice Garnet.



**Field Trip:**

Field trip this Friday to Martin Marietta Fountain Quarry, be there at 8:45 to listen to safety talk.

**Close of Meeting:**

The meeting was adjourned.

Respectfully Submitted

Julie Niederkorn,

Vice-President, Tar Heel Gem and Mineral Club, Inc.

**July Treasurer's Report**

Jan. Ending /	
Feb. Beginning Balance	\$8,861.13
-----	
Deposits (+)	
Members	\$90.00
-----	
Sub total	\$90.00
-----	
Checks Written (-)	
Newsletter	\$127.46
Wild Acres-Harris	\$185.00
Wild Acres- Freed	\$185.00
-----	
Sub Total	\$497.46
-----	
Feb. Ending /	
Mar. Beginning Balance	\$8,453.67
-----	
Deposits (+)	
Dealers (Show)	\$11,365.00
Members (Show)	\$430.00
Sale-Facet Mach (Show)	\$175.00
Silent Auction (Show)	\$853.75
Hospitality Booth (Show)	\$1,227.00
Geodes Booth (Show)	\$6,286.68
-----	
Sub total	\$20,337.43
-----	
Checks Written (-)	
Insurance - Year	\$467.00
Storage - Year	\$1,440.00
Postal	\$839.80
Miscellaneous Supplies	\$223.92
IMP Printing (Show)	\$396.63
Panara prepaid (Show)	\$296.25
Geodes & supplies (Show)	\$4,833.58
Start - up cash (Show)	\$455.00
-----	
Sub Total	\$8,952.18
-----	

Mar. Ending /	
Apr. Beginning Balance	\$19,838.92
-----	
Deposits (+)	
Members	\$65.00
-----	
Sub total	\$65.00
-----	
Checks Written (-)	
Rocks for bags (Show)	\$902.48
N & O Adv (Show)	\$1,081.71
Saw supplies (Show)	\$94.71
Show supplies	\$333.43
Wild Acres - Freed	\$205.00
IMP Newsletter	\$127.46
NC State Fair (Show)	\$10,471.00
UP Stairs Food (Show)	\$65.85
Hospitality postal (Show)	\$29.74
Upstairs food (Show)	\$687.09
-----	
Sub Total	\$13,998.47
-----	
Apr. Ending /	
May Beginning Balance	\$5,905.45
-----	
Deposits (+)	
Members	\$20.00
-----	
Sub total	\$20.00
-----	
Checks Written (-)	
Newsletter	\$127.46
-----	
Sub Total	\$127.46
-----	
May Ending /	
Jun. Beginning Balance	\$5,797.99

**Expedition to the Cruzeiro Tourmaline Mine in Minas Gerais, Brazil – Part 2**

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**Regional and Local Geology of the Cruzeiro Mine**

In South America, the São Francisco craton (an old and stable part of a continent), which forms eastern Brazil, is surrounded by a sequence of Brazilian orogenic belts. One of them is the Araçuaí belt, featuring west to northwest-extending thrusts and folds. The Araçuaí belt borders the eastern margin of the São Francisco craton and overlaps with EBPP.

During the post-collision stage (530 to 480 million years ago), bodies of intrusive igneous rocks, called plutons, penetrated the metamorphic rocks of the Araçuaí belt. One of

these plutonic rocks is considered the source of many pegmatites containing gem tourmaline, spodumene, morganite, and other gems, plus industrial feldspar and muscovite. Although it is quite common to find large batholiths—emplacements of plutonic rock—in the immediate vicinity of gem-bearing pegmatites, in some areas the plutonic source rocks are not well exposed.

This schematic geological map of the Araçuaí and Governador Valadares regions shows the location of the Cruzeiro pegmatites. – Modified after Viana et al., 2007, Chemical zoning of muscovite megacrystal from Brazilian Pegmatite Province; and Federico et al., 1998, Compositional

variation of tourmaline in the granitic pegmatite dykes of the Cruzeiro mine, Minas Gerais, Brazil

The current Cruzeiro main mining area consists of four parallel, largely unweathered granitic pegmatite bodies, identified as pegmatites 01, 02, 03, and 04, and another pegmatite between 01 and 02, identified as pegmatite 01½. There are many other pegmatite outcrops on this property, but the major operation is focused on these four veins. All four pegmatite bodies dip steeply to the southwest and intrude into quartzite (metamorphosed sandstone).

### Cruzeiro mine.

The contacts between the pegmatite bodies and the host quartzite are sharply defined. Pegmatite 01 is 1300 meters long and up to 60 m wide. Pegmatite 02 is 900 m long and about 20 m wide. Pegmatite 03 is about 700 m long, with a maximum outcrop width of 8 m. There are no exact dimensions of pegmatite 04 currently available. The maximum width of pegmatite 01½ is so far thought to be about 30 m.



In the Cruzeiro mine area, the contacts between the pegmatite bodies and the host quartzite are all sharply defined. The white clay minerals that define the pegmatites are the products of weathered feldspars, which are more vulnerable to weathering than quartzite. Below the surface, the width of the pegmatite can be quite different from the width seen in this partially exposed pegmatite body. Photo by Andy Lucas/GIA, courtesy Cruzeiro mine.

### Tragedy, Perseverance, and Success

Whitish albite, purple lepidolite, and the yellowish to brownish iron-manganese coatings are indicators that lead miners to gem-quality tourmalines. A good quantity of nice rubellite crystals was recovered from the pocket in the upper left of this photo. Photo by Andy Lucas/GIA, courtesy Cruzeiro mine.

These pegmatitic veins have very similar internal zoning, symmetrically distributed around a quartz core. The zoning contains a very thin border zone, a muscovite-quartz-feldspar wall zone and a quartz-microcline-albite intermediate zone, where the economically important gemstones are found. In the Cruzeiro mine, gem-quality tourmaline is usually found right next to the quartz core and associated with albite rather than microcline feldspar. Massive non-gem garnet is also found in this mine.

### The Thrill of Discovery

Speaking with unbridled enthusiasm, Douglas Neves and his Aunt Beatrice described for us the thrill of discovering major tourmaline pockets and crystals. They are ready to come to the mine at a moment's notice 24 hours a day, and even though they have experienced such moments thousands of times, they feel the same sense of excitement, like a kid receiving his best present, or a parent giving birth to a child. Their first reaction is a desire to keep the tourmaline and never sell it, but the reality is that they must sell their stones to keep the business going. If an important pocket is found, they may work all night to remove the tourmaline crystals, which have become more and more valuable over the last several years, due primarily to the enormous demand in China.



For Beatrice and the other family members, the thrill of discovering tourmaline is as strong today as it ever was. Photo by Andrew Lucas/GIA, courtesy Cruzeiro mine.

### Production

Of the eight tons of annual production, approximately 70 percent is carving and bead quality, 10 percent is clean facet grade, 10 percent is cabochon grade, and 10 percent is suitable for specimens. The Cruzeiro mine produces all tourmaline colors. Douglas estimates that green makes up the largest percentage of total production. Pink and rubellite colors make up about 30 percent, and blue about 10 percent.

These color percentages are difficult to estimate because many of the crystals are bicolored or multicolored, with crystals commonly going from pink or rubellite colors to green, and terminating in black. The black tourmaline is often highly fractured and sold for industrial uses.

### Visiting the Mine

The mine is about 36 miles northwest of Governador Valadares and about six miles from the town of São José da Safira. The latter is named after sapphire, probably due to blue tourmalines found and mistaken for sapphires by early explorers. We drove to the top of the mountain Serra Resplendente do Cruzeiro, where the mine is located at 4,593 feet. The mine and a small nearby village are both named Cruzeiro, meaning cross due to the presence of a local church.



Navigating the mine involved descending to different depths on vertical to near-vertical ladders, and then following horizontal galleries. Photo by Andrew Lucas/GIA, courtesy Cruzeiro mine.

The Cruzeiro mine has an extensive array of horizontal mining tunnels, called galleries, located at different depths. Some of the galleries are very long: One extends to 500 meters. This mine's pegmatites are enormous. At the deepest mining area, the pegmatite is 32 meters wide and over one kilometer in length. The property itself is close to 3,000 hectares (a hectare is equal to 2.471 acres). The area

that is actually being mined is only around 100 hectares, but much of the rest of the property shows promise for successful future production.

Pegmatite 01½ has its name because they discovered it while attempting to tunnel into vein number 01 from a different direction. They soon realized they were in a new vein that connected with veins 01 and 02. Vein 01½ is currently their most productive vein. They refer to it as Umbezão, which means "the big one."

### The Mining Operation

In 1996, the mining operation was re-structured to incorporate modern mining methods. Currently, Cruzeiro is working three veins. The current mining plan includes a new entrance and new ramp as well as further assessment of all the pegmatites. They evaluate a pegmatite by looking at its central quartz core zone, where they find green tourmaline at the side contact areas. Next to the green zones are pink and rubellite colors, and then mica. Drilling near the quartz core veins, they look for lines of black tourmaline and indicator minerals of lithium, lepidolite, albite, and mica. Besides tourmaline, they also find colorless, white, and rose quartz, aquamarine, morganite, and red garnets. However, tourmaline is the focus as it's the most economically important gemstone mined here.

The processing stage is simple and uses classic methods. The rough is washed by hand in wire baskets submerged in large drums of water. Manipulating the baskets in a circular motion allows the water to wash away the smaller pieces of lighter overburden, leaving larger crystals behind. While we watched, several large tourmaline crystals were recovered. Many of them were multicolored, with red-to-pink rubellite transitioning to green, and with black terminations. Some of the crystals were quite large. There were also large blue and green crystals. After washing, the crystals were cleaned further and some were rolled in newspaper for protection, a common technique that's used especially for specimens.

### The Business Model

The mine owners are rejoicing at the current demand for tourmaline in the global market. The mine produces all colors of tourmaline, so they can take advantage of the fact that all colors are in demand. Demand is especially strong for rubellite and bicolor varieties, with strong demand for greens, followed by blues. One of the main tourmaline consuming countries is China. This has been especially true with rubellite and now is also true for bicolored, greens, and blues.

The Cruzeiro mine works with Miranda Group Co. Ltd., which cuts their rubellite tourmaline and markets it through KGK, a global diamond, colored stone, and jewelry wholesaler. KGK markets the majority of the rubellite in China. The Miranda Group saws the rough at their Hong Kong office and then sends the sawn rough for finishing at their factory in Shenzhen. KGK then handles the sale of the finished rubellites. The company also sells rubellite jewelry in China.

The majority of Cruzeiro production goes to China. Cruzeiro itself cuts the green and blue facet-grade material in Governador Valadares and sells the finished stones in the wholesale market. Cruzeiro sells carving, bead, and cabochon-grade rough into the China market for manufacturing.

Describing the changes in the price of tourmaline over the last five years, Douglas says, "When I think about the prices I sold tourmaline for five years ago, I did not sell it, I gave it away." Five years ago it would have been difficult to get \$1,000 a kilo for carving and bead-grade rough tourmaline, while today he can easily get \$7,000 a kilo. Facet-grade green tourmaline that was selling for ten to twenty dollars a gram five years ago, now sells for \$150 a gram.

These increases in the selling price are offset by increased production costs. Costs of labor, fuel, equipment, environmental regulations, etc., have risen significantly over the last five years. Also, the value of the Brazilian currency—the Real—has risen significantly against the dollar. This was difficult for the entire Brazilian gemstone and jewelry industry since their costs are in Reals and their sales on the international market are in dollars. This reversed a bit in the

last two years, with the Real going from approximately 1.5 to 1 dollar in value. During our visit, there was a drop in value to 2.4 Reals to the dollar. The massive production from the Cruzeiro mine also helps it to compensate for increasing production costs.

### The Future

When describing the mine's future, Douglas informed us that they are planning to turn it into a ramp-style mine. The ramp will start at the surface and cut across all five main pegmatite veins currently being mined, plus one more they are planning on mining. Shafts will extend upward from the ramp so they can bring the material down to the ramp and haul it out by truck.

With over 95 percent of the property not being mined and large areas showing strong production potential, the future yield of the mine looks strong. Douglas told us that his father always said that his grandchildren would be mining tourmaline at Cruzeiro.

<http://www.gia.edu/gia-news-research-cruzeiro-tourmaline-mine-expedition>

## **Vugsites**

The following are some links to Web-Sites that may interest some of our members:

<http://www.amfed.org> / <http://www.amfed.org/sfms> These are the official sites for the organizing body that the Tar Heel Gem & Mineral Club is founded under. I would strongly urge all members to check them out on a regular basis.

[http://www.amfed.org/sfms/lodestar\\_newsletter.html](http://www.amfed.org/sfms/lodestar_newsletter.html) The SFMS Lodestar Newsletter

<http://www.carolinageologicalsociety.org/CGS/Home.htm> This site provides numerous downloadable field-trip guide books, maps, and charts of the Carolinas. It will prove to keep any avid rock hound busy for years. Great Site!

[http://www.ncminerals.com/ncmineralswebsite\\_files/page0011.htm](http://www.ncminerals.com/ncmineralswebsite_files/page0011.htm) And while we are on the subject, try this link. Its titled: Links of Interest to Rock hounds in NC. It will take you to a list of links for North Carolina gems and minerals.

<http://www.rocksforkids.com/> Just like the name says, a nice place to steer the younger members.

Information & photographs of over 6300 specimens from the Glenn & Martha Vargas Gem & Mineral Collection.

<http://www.rockhoundlounge.com> Scott Laborde, a club member maintains his own web site that might be of interest to people collecting in and around Wake County.

[http://www.msnbc.msn.com/id/29726500/ns/technology\\_and\\_science-science](http://www.msnbc.msn.com/id/29726500/ns/technology_and_science-science) This site highlights a half dozen of the most recent significant fossil finds.

<http://appmodo.com/13971/mole-quest-for-the-terracore-gem-app-review-for-the-iphone-and-ipod-touch/> If you have an iphone or an ipod touch, this rock-hounding may be the game for you.

[http://diamonddanpublications.net/index\\_files/page0009.html](http://diamonddanpublications.net/index_files/page0009.html) Diamond Dan's Mini Miner's Monthly

I would like to encourage all members of the THG&MC that maintain their own presence on the internet to send me a link to their site to be published in future Vugsites so that other club members may learn and enjoy the craft, the art, the interests that many of us have in common.

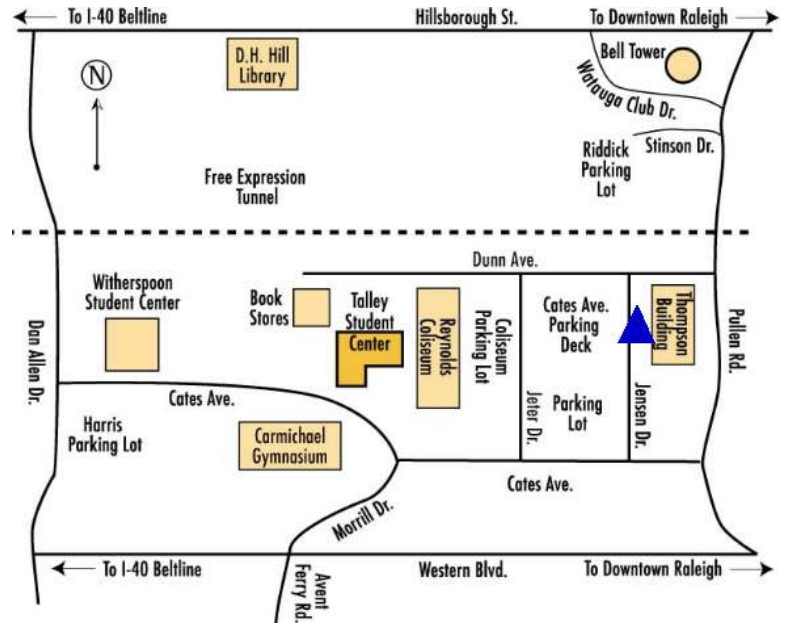
Park in the Cates Ave. Parking Deck off Jensen Dr. Enter Thompson Building directly across from the parking lot.

**Our Next Meeting is  
July 21, 2015 @ 7:30PM  
Thompson Building / NCSU Campus.**

***About Our Organization...***

The Tar Heel Gem and Mineral Club, Inc. was formed in 1974 as a nonprofit educational organization for people who enjoy the lapidary arts, earth sciences, and related subjects. The main objectives of the club are to investigate, preserve, and share knowledge of rocks, minerals, and precious stones, and to promote interest in mineralogy, paleontology, earth sciences, and lapidary techniques, among club members and among the general public. The club pursues these goals through publications, meetings, lectures, field trips, exhibits, demonstrations, and other activities.

**Come and be a part of the Fun!**



**TAR HEEL GEM & MINERAL CLUB**  
10609 Chelsea Drive  
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